

1. A method of enhancing an image, comprising:  
smoothing the image to produce a smoothed image; and  
performing lowpass filtering on the smoothed image to  
produce an enhanced image.

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2. The method of claim 1, wherein smoothing comprises:  
applying a two-dimensional filter to a pixel in the  
image;

storing a pixel processed by the two-dimensional filter  
in the smoothed image; and

repeating storing and applying for one or more other  
pixels in the image.

3. The method of claim 1, wherein performing lowpass  
filtering comprises:

applying a one-dimensional filter to a pixel in the  
smoothed image;

storing a pixel processed by the one-dimensional filter  
in the enhanced image; and

repeating storing and applying for one or more other  
pixels in the smoothed image.

4. The method of claim 1, wherein lowpass filtering is performed using a filter having a sharp high-frequency cutoff.

5 5. The method of claim 1, further comprising detecting an edge in the smoothed image;

wherein lowpass filtering is performed only on non-edge areas of the smoothed image.

10 6. The method of claim 5, wherein detecting the edge comprises applying an edge filter to the smoothed image.

7. The method of claim 1, further comprising applying a median filter to the enhanced image;

15 wherein the median filter is designed to reduce artifacts on the enhanced image.

8. The method of claim 7, wherein the median filter is applied only to non-edge areas of the enhanced image.

20 9. A method of performing inverse halftoning on a halftoned image, comprising:

smoothing the halftoned image using a two-dimensional filter to produce a smoothed image;

detecting edge areas in the smoothed image;  
performing lowpass filtering on non-edge areas of the  
smoothed image; and  
generating an enhanced image comprised of the edge areas  
5 of the smoothed image and lowpass-filtered non-edge areas of  
the smoothed image.

10. The method of claim 9, further comprising applying a  
median filter to non-edge areas of the enhanced image;

10 wherein the median filter is designed to reduce artifacts  
in the enhanced image.

11. An article comprising a machine-readable medium that  
stores machine-executable instructions for enhancing an image,  
15 the instructions causing a machine to:

smooth the image to produce a smoothed image; and  
perform lowpass filtering on the smoothed image to  
produce an enhanced image.

20 12. The article of claim 11, wherein smoothing  
comprises:

applying a two-dimensional filter to a pixel in the  
image;

storing a pixel processed by the two-dimensional filter  
in the smoothed image; and

repeating storing and applying for one or more other  
pixels in the image.

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13. The article of claim 11, wherein performing lowpass  
filtering comprises:

applying a one-dimensional filter to a pixel in the  
smoothed image;

10 storing a pixel processed by the one-dimensional filter  
in the enhanced image; and

repeating storing and applying for one or more other  
pixels in the smoothed image.

15 14. The article of claim 11, wherein lowpass filtering  
is performed using a filter having a sharp high-frequency  
cutoff.

20 15. The article of claim 11, further comprising  
instructions that cause the machine to detect an edge in the  
smoothed image;

wherein lowpass filtering is performed only on non-edge  
areas of the smoothed image.

16. The article of claim 15, wherein detecting the edge comprises applying an edge filter to the smoothed image.

5 17. The article of claim 11, further comprising instructions that cause the machine to apply a median filter to the enhanced image;

wherein the median filter is designed to reduce artifacts on the enhanced image.

10 18. The article of claim 17, wherein the median filter is applied only to non-edge areas of the enhanced image.

15 19. An article comprising a machine-readable medium that stores machine-executable instructions for performing inverse halftoning on a halftoned image, the instructions causing a machine to:

smooth the halftoned image using a two-dimensional filter to produce a smoothed image;

20 detect edge areas in the smoothed image;

perform lowpass filtering on non-edge areas of the smoothed image; and

generate an enhanced image comprised of the edge areas of the smoothed image and lowpass-filtered non-edge areas of the smoothed image.

5           20. The article of claim 19, further comprising instructions that cause the machine to apply a median filter to non-edge areas of the enhanced image;

          wherein the median filter is designed to reduce artifacts in the enhanced image.

10           21. An apparatus for enhancing an image, comprising:  
a memory that stores executable instructions; and  
a processor that executes the instructions to:

15                 smooth the image to produce a smoothed image; and  
               perform lowpass filtering on the smoothed image to produce an enhanced image.

22. The apparatus of claim 21, wherein smoothing comprises:

20           applying a two-dimensional filter to a pixel in the image;

          storing a pixel processed by the two-dimensional filter in the smoothed image; and

repeating storing and applying for one or more other pixels in the image.

23. The apparatus of claim 21, wherein performing

5 lowpass filtering comprises:

applying a one-dimensional filter to a pixel in the smoothed image;

storing a pixel processed by the one-dimensional filter in the enhanced image; and

10 repeating storing and applying for one or more other pixels in the smoothed image.

24. The apparatus of claim 21, wherein lowpass filtering is performed using a filter having a sharp high-frequency  
15 cutoff.

25. The apparatus of claim 21, wherein:

the processor executes instructions to detect an edge in the smoothed image; and

20 lowpass filtering is performed only on non-edge areas of the smoothed image.

FOR THE UNITED STATES

26. The apparatus of claim 25, wherein detecting the edge comprises applying an edge filter to the smoothed image.

27. The apparatus of claim 21, wherein:

5 the processor executes instructions to apply a median filter to the enhanced image; and

the median filter is designed to reduce artifacts on the enhanced image.

10 28. The apparatus of claim 27, wherein the median filter is applied only to non-edge areas of the enhanced image.

29. An apparatus for performing inverse halftoning on a halftoned image, comprising:

15 a memory that stores executable instructions; and

a processor that executes the instructions to:

smooth the halftoned image using a two-dimensional filter to produce a smoothed image;

detect edge areas in the smoothed image;

20 perform lowpass filtering on non-edge areas of the smoothed image; and

generate an enhanced image comprised of the edge areas of the smoothed image and lowpass-filtered non-edge areas of the smoothed image.

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30. The apparatus of claim 29, wherein  
the processor executes instructions to apply a median filter to non-edge areas of the enhanced image; and  
the median filter is designed to reduce artifacts in the enhanced image.

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